

## Template for Transmittal of ORD Products to NPDs: FY2016

The ORD National Program Directors (NPDs) are responsible for delivery of products to ORD's partners. This document provides a template for ORD Laboratories and Centers (L/C) to use for the transmittal of completed FY 16 products to the respective NPD. These product descriptions are used for product databases which serve as the one of the first lines of project detail presented to partners. The descriptions should be short but comprehensive, and appropriate for a range of scientific understanding.

### Topic: Community and Site-Specific Risk

**Project Title:** Cumulative Risk Assessment Methods and Applications

**Project Leads/Co-Leads:** Deborah Segal and Michael Wright

**RMS Project Number:** 3.23

**Product Title:** Apportioning Chemical Stressors for the most affected portions of exposed human populations and ecological receptors

### Product Type:

☒ Journal Article   ☐ Database   ☐ Software   ☐ Model   ☐ Methodology   ☐ Other: \_\_\_\_\_

**Product Contact:** Jennifer Richmond-Bryant (NCEA)

**Key Products (Y/N):** Y

**Matrix Interface/MI Advocates:** Beth Owens (NCEA)

**L/C:** NCEA and NERL

**Roadmaps:** If the research applies to any of the ORD Research Roadmaps please indicate this.

☒ Children's Environment Health   ☐ Nitrogen and Co-Pollutants  
☐ Climate Change   ☐ Environmental Justice

**Product Key Words:** Please provide 4 key words for this product such as those that may be used for a manuscript submission.

Cumulative exposure, phthalates, biomonitoring, Maximum Cumulative Ratio

**Brief Description:** For each bullet provide 2-5 sentences explaining the research and its impact. Include appropriate key words, but avoid jargon and acronyms that may not be familiar to those outside of your field.

Agency Research Drivers - Provide context for the research by addressing the Agency drivers (i.e., what regulatory framework does your work fall under, for example: pesticide registration, endangered species). Some phthalates are regulated as hazardous air pollutants under the Clean Air Act §112(b)(1).

The Integrated Risk Assessment (IRIS) program was developed to support the Office of Air and Radiation's Risk and Technology Review (RTR) process, and the research to be published in this manuscript will inform the IRIS for Phthalates.

- Science Challenge – Provide context for the research effort from the scientific perspective – statement of problem.

Several approaches may be used to inform the quantification of risk to chemical mixture co-exposures. Humans are exposed to the group of chemicals known as phthalates from many sources through multiple exposure pathways. A cumulative risk approach would be most appropriate to assess the risk associated with exposure to these chemicals. This analysis evaluates two approaches, the Hazard Index/Hazard Quotient and Maximum Cumulative Ratio, to quantify the potential for concern over co-exposures to phthalates.

- Research Approach – A brief description of the methods, why they were chosen, and how they will be used to address the science challenge.

Maximum Cumulative Ratio, Hazard Index, and phthalate-specific Hazard Quotient approaches were applied to biomonitoring data from the National Health and Nutrition Examination Survey (2013-2014) for exposures to six phthalates. Reverse dosimetry techniques were used to calculate steady-state doses consistent with concentrations of metabolites of the six phthalates in urine and using Tolerable Daily Intake values in line with previous, well-known publications.

- Results – Briefly summarize the results.

The manuscript indicates that cumulative risks are driven by relatively large doses of a single phthalate rather than doses of multiple phthalates. The individual phthalate driving the risk varied across the participants examined. Children (age 6-17 years) experienced a higher mean hazard index compared with adults (18+ years).

- Anticipated Impact/Expected use – Why are the results important? What are the next steps related to the research results? Who are the users of the data? What are the broader impacts?

This analysis concluded that the use of cumulative risk approaches had a measureable impact in the evaluation of hazard among the six phthalates in individuals aged six years and older. The analysis suggested that the cumulative approach was able to identify exposures of concern that would have been missed if using a single chemical exposure risk assessment. However, the individuals with the largest risks were identified by single phthalate assessment approaches. Next steps include investigate population-wide, temporal trends in hazard using the same phthalates from the previous five cycles of NHANES spanning from 2005-2014. As hazards reduce, mixtures become increasingly important in identifying main drivers and combinations of drivers of hazard within an individual.

#### **Attachments:**

List all deliverables associated with this product/output using the format below. Include the ORD clearance tracking number (from STICS) and hyperlink to product (if applicable). If listing a journal article that has not been published yet, include the name of publication the article was or will be submitted to.

Reyes, J.M. and Price, P.M., An analysis of cumulative risks based on biomonitoring data for six phthalates using the Maximum Cumulative Ratio. Submitted to Environment International. ORD-022061

**URL:**

If product/output is ONLY web-based (e.g. a website, online tool, model, etc.), list the title and the URL below. Example:

[ HYPERLINK

"file:///C:/Users/pprice04/AppData/Local/Microsoft/Windows/INetCache/Content.Outlook/VNZYDP2C/Nor" ] appable.